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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/705,254	11/10/2003	Paul J. Campagnola	UCT-0036	3199
23413	7590	02/23/2006	EXAMINER	
CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002			HAMILTON, CYNTHIA	
			ART UNIT	PAPER NUMBER
			1752	
DATE MAILED: 02/23/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/705,254

Applicant(s)

CAMPAGNOLA ET AL.

Examiner

Cynthia Hamilton

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11/29/06.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 14, 21-27 is/are pending in the application.
- 4a) Of the above claim(s) 6 and 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-11 and 21-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-11, 14 and 21-27 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

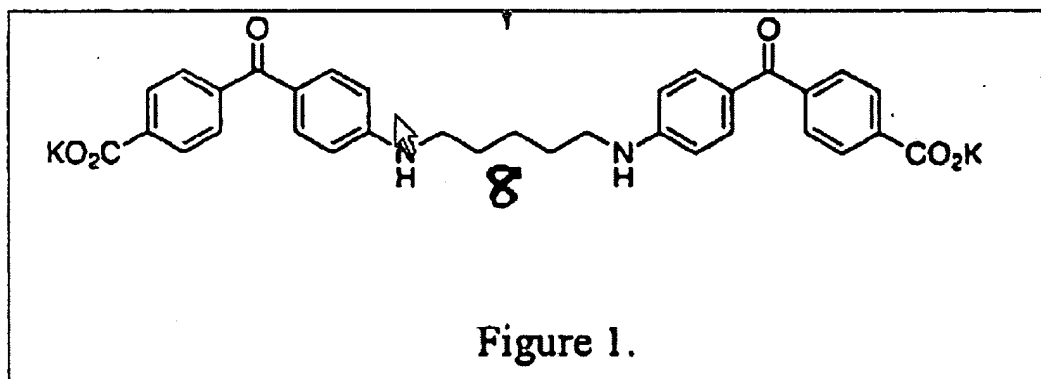
Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11/29/2005</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The examiner notes for the record that applicants have on November 29, 2006 amended claim 1 to cancel "one photon" photoactivating option in the claimed invention. Applicants have also added to claim 1 the requirement that the crosslinking produce a three-dimensional structure. Thus, claims 1-11 and 14/1 are limited now to a photoactivating ... by multi-photon excitation..." step and the production by the method of a "three-dimensional structure". The examiner notes the addition of new claims 21-27 which are not so limited. Claim 21 has a photoactivating ... by one-photon or by multi-photon excitation..." step with no limitation on the structure of the product formed and the limits on the structure of the photoactivable crosslinker similar to original claim 8. There is no limitation in claims 21-27 to "...the point volume of the activation has at least one dimension of less than about 1 micron". Thus, claims 21-27 are drawn to a method broader than present during the original examination and restriction of the original claims.

2. Applicant's election of Group I, claims 1-11, 14/1 in the reply filed on April 20, 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Applicants elected as a species for Group 1, the photoactivatable crosslinker, the crosslinker shown in Figure 1 (compound 8) wherein the photoactive groups is an acid salt-substituted benzophenone, the linkers are amines and the bridging moiety is a saturated, unsubstituted Cs alkyl chain and the molecule being crosslinked in the method as collagen. The compound 8 is shown below:



Applicants make of record that the elected species reads on claims 1 -5 and 7-11. Applicants in their response of April 20, 2005 made no traverse of the requirement for election of species.

Claims 1-11 and 14/1 remain. Claims 12-13 and 15-20 have been cancelled. Claims 21-27 have been added. Applicants did not make of record what claims still read on the elected species, especially the new claims 21-27, in their response and amendment of November 29, 2005. Claims 21-27 are drawn to a broader process than the original claims because there is no limitation to the "...the point volume of the activation has at least one dimension of less than about 1 micron" in the process or product formed. The examiner searched with respect to US classification at class 430, subclass 8 which is defined as set forth below:

**MICROGRAPHY, PROCESS,
COMPOSITION, OR PRODUCT
OTHER THAN
MICROELECTRONIC DEVICE
MANUFACTURE:**

This subclass is indented under the class definition. Processes wherein an image of the order of less than a few microns in size of an object, or of an instrumented or discernible phenomenon is produced in a medium, such as images produced in microfilm or microfiche, etc.; radiation sensitive or image receiving compositions and products manufactured, or specially adapted for use in obtaining images less than a few microns in size; and processes of making the composition or product.

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While the examiner did other global searches without considering all of any one subclass, via text searching, she searched with respect to micron sized images and objects. Applicants have presented a second set of genus claims of which only the elected species will be considered in claims 21-27.

3. Claim 14/12 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. There is no previous claim 12 now of record upon which claim 14 can depend.

4. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodman et al (WO (99/54784) optionally evidenced by McGinniss (Radiation Curing, Kirk-Othmer Encyclopedia of Chemical Technology) or Thompson et al (Introduction to Microlithography, second edition). Goodman et al teach on page 4, the formation of activated volumes of less than 150 nm in one direction. These are inclusive of crosslinking materials as set forth at the bottom of page 9, and bottom of page 11. With respect to instant claims 1-2, the use of the biarylazide systems are taught by Goodman et al on page 15 (as shown below)

15 Photopolymerizable precursor compositions are also suitable for use with the present invention. In photopolymerizable compositions each propagation step is effected by the incident radiation, and photopolymerization may be achieved using photo-crosslinking agents such as bisarylazides or photocross-linkable oligomers and polymers. Such oligomers and polymers contain chromophoric groups that undergo
20 light-induced chemical bonding with each other. The chromophoric groups may be in the polymer backbone, for example a backbone chalcone group, or pendent, for example a poly(vinyl cinnamate).

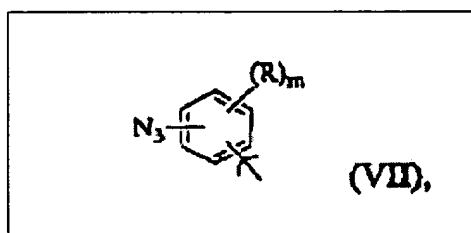
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of use in their imaging systems making the use of chromophoric substituted diazides as crosslinkers in such methods prima facie obvious as suitable. McGinniss on page 13 at Fig. 6, shows at (b) the nature of azide crosslinking with ethylenically unsaturated polymers. As set forth on the same page, these azide groups form free radicals and as shown in the figure crosslink the polymers. Thus, the azide or the arylazide is the photoactive component with bis referencing two of the components being together and linked via an organic group of some kind as generally shown in McGinniss. Thompson et al also show this on pages 162-164.

5. Applicant's arguments filed November 29, 2005 have been fully considered but they are not persuasive. Applicants concede that Goodman et al is directed to the use of multi-photon excitation to fabricate structural features having dimensions of less than about 1 micron. Applicants agree that Goodman et al on page 15 teach bisarylazides are disclosed as possible crosslinking agents. Applicants argue, however, that bisarylazides are themselves photoactive groups and thus two such groups would be required to form the crosslinker of the present claims. Applicants allege that Goodman et al does not disclose the crosslinker comprising at least two photoactive groups linked by a bridging moiety as presently claimed and thus does not render the present claims obvious. The examiner believes that applicants are arguing that the "bisarylazide"

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is only one photoactive group and thus not two as required and that there is no bridging group present. The examiner notes that the photoactive group of the bisarylazides is the arylazide and by “bis” there are two of the photoactive groups present. This is generally shown in McGinnis which is added to the rejection only to show the inherent nature of bisarylazide compounds and crosslinking as free radical generating systems as known in the art. Applicants presented no evidence to support their allegations about the need for two bisarylazide groups being linked by a bridging moiety to meet the instant limitation of “... the crosslinker comprises at least two photoactive groups covalently linked by a bridging moiety...”. Thompson et al on page 164 in Figure 19 clearly shows the bisarylazide having an X linking moiety. The examiner holds that each arylazide group is the photoactive group and whatever links them is the covalent linking group. The examiner notes that in instant claim 8, the (VII) structure is a subgenus of the arylazide structure as shown below:



. The aryl group is limited to phenyl or phenyl substituted ring in applicant's claim 8. This same structure is shown in Thompson et al. Thus, the examiner holds applicants' allegations without further evidence to be unfounded. The rejection stands and is now further supported by references showing the known nature of bis arylazide compounds used as crosslinkers, the presence of two photoactive arylazide groups and the knowledge that free radicals are produced in the formation of the crosslinking which occurs.

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6. Claim 14 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on April 20, 2005.

7. The examiner agrees to the following allegations made by the applicant in their arguments filed November 29, 2005.

a. Vallee et al with respect to instant claims 1 and 4 as now limited to multi-photon excitation steps does not read on the instant method. Vallee makes no mention of using multiphoton excitation steps. The examiner makes no comment with respect to the issue of three-dimensional formation versus two-dimensional formation on the micron level.

b. Yang et al with respect to instant claims 1 and 2 as now limited to multi-photon excitation steps does not read on the instant method. Yang et al makes no mention of using multi photon excitation steps. The examiner makes no comment with respect to the alleged reasons set forth by applicants.

c. Nomura et al with respect to instant claims 1, 3, 7 and 11 as now limited to multi-photon excitation steps does not read on the instant method. Nomura et al makes no mention of using multi photon excitation steps. The examiner makes no comment with respect to the alleged reasons set forth by applicants.

d. Wright et al with respect to instant claims 1, 3, 7 and 11 as now limited to multi-photon excitation steps does not read on the instant method. Wright et al makes no mention of using multi photon excitation steps. The examiner makes no comment with respect to the alleged reasons set forth by applicants.

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8. Claims 1-5 AND 7-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The specification does not make clear what point volume is meant by "point volume of the activation". Is this the point volume generated by the imaging system as in Campagnola (Macromolecules 2000) at 1000 nm, i.e. as in second column last quadrant or is this the point volume of the crosslinked area generated by the imaging source as in 500 nm in Conclusions on page 1513 of Campagnola? It is unclear from the specification whether the final product has an image feature with a crosslinked point volume of "less than about 1 micron" or that the source of irradiation forms a point volume of activation at "less than about 1 micron". This is key to understanding what is encompassed by the instant invention. Is the limit to the imaging source or to the final product dimension dependent upon the composition used? Thus, claims 1-5 and 7-11 set forth a method that is found confusing. The limitations of the method are not clear at this point. The examiner notes that she has considered both interpretations in the examination of the elected invention and species.

9. Applicant's arguments filed November 29, 2005 have been fully considered but they are not persuasive. With respect to applicant's explanation of "point volume of activation" in their response of November 29, 2005, the applicant has not made clear that the process of claim 1 and 21 references a "point volume of activation" of the photoactivating source or that of the resultant cured volume. Applicants allege that "...because the process is a photochemical process, photochemistry occurs substantially within the volume of the excitation provided." Applicants allege further to what a one of skill in the art would understand but applicants fail to present any evidence to support their allegation of this understanding. Applicants alleged that "one of skill in

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the art” would understand that the point volume of the features produced is “substantially the same as the point volume of excitation used to produce the feature.” This allegation makes an assumption that no spread of cure occurs or “substantially” no spread of cure occurs. Applicants allege “Inherent in the method is that the point volume of activation is substantially the same as the point volume of the feature produced by the excitation.” In responding to the question of clarity with respect to the meaning of “point volume of activation”, applicants have alleged they are both a step of activation and a final result. No evidence is presented to show one of skill in the art would so understand this to be the fact. The examiner notes that the points of volume being limited are to that of one micron or less. The rejection stands as the claim language has not been made clear.

10. Claim 6 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on April 20, 2005.

11. With respect to applicant’s arguments of November 29, 2005 drawn to the difference between a two-dimensional structure and a three-dimensional structure, the examiner notes that even flat structures are three dimensional with depth, width and length measurements. The applicant is to keep in mind that the measurements are in units of less than about a micron. An explanation as to how a structure with depth, width and length can be two dimensional and not three dimensional is not made by applicants in their arguments. Thus, applicant does not make this allegation of a difference clear over the structures formed in the prior art.

12. With respect to the examiner’s noting of [0020] and “derivatized and synthetic variations”, instant claim 2 includes “phenylglyoxalic esters and derivatives thereof” and if this

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terminology of [0020] is meant as definition of the terms, it is put out as being seen by the examiner and considered in examination.

13. With respect to applicant's allegation that the photoactive groups "are defined as groups that decompose to form free radicals or other wise cause the formation of free radical that initiate crosslinking, the examiner notes paragraph [0010] below:

[0010] Suitable crosslinkers have at least two photoactive groups, i.e., groups that are activatable by single- or multi-photon excitation. Upon absorption of light in the long ultraviolet to far infrared spectral range (250 – 900 nm), the photoactive groups decompose to form free radicals or otherwise cause the formation of free radicals that initiate crosslinking. Two or more different types of photoactive groups may be present on the same crosslinker. The photoactive groups are covalently attached to a bridging moiety that does not substantially interfere with the photoinitiation or crosslinking reactions. The bridging moiety may further comprise functionalities that moderate the reactivity of the activatable chromophores, or that provide additional reactivity, for example chemical reactivity. The length of the bridging moiety is preferably adjusted to provide the desired reactivity and/or three-dimensional structure.

There is no clear definition in this paragraph limited the crosslinkers having at least two photoactive groups to those only forming free radicals. "Suitable" here does not set forth a definition clearly to limit the crosslinkers of the claimed invention. What is set forth in this paragraph is a preference for the crosslinkers. The examiner does not take this passage as an example of applicants clearly setting forth a definition of the term that is different from its ordinary and customary meaning (s). See *In re Paulsen*, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994) and MPEP 2111.02, III. 8th ed, May 2004 revision. Suitable does not exclude other crosslinkers but acts to set forth a preferred group of crosslinkers. The citation of 250 to 900 nm does not limit the excitation wavelength of the step of the instant methods either.

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Thus, applicants arguments with respect to the requirement that the crosslinker act via generation of a free radical and that this is a limit by definition in the specification is not seen by the examiner when reading paragraph [0010] in the original specification. This is what the examiner means when she states that “suitable” does not limit the claim language.

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

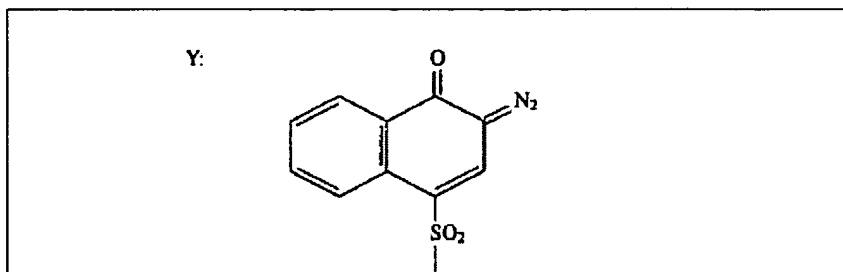
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

15. Claims 21-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Zweifel et al (4,197,133). With respect to instant claims 21-26, the composition of Example 13 as set forth in col. 11-12 of Zweifel et al anticipates the instant composition wherein the molecules to be crosslinked are the polymer and the bis-azide is a Markush member VII in instant claim 21 given as a photoactivatable crosslinker. The composition of Zweifel et al is imaged by photoactivating the crosslinker by one-photon excitation. Q is $(CH_2)_4$ and each L is $-C(=O)-NH-$ with R being $-COOH$, i.e. carboxyl, and $n=1$. The crosslinker is inherently substantially water-soluble and it is an acid and since no acid salt is given then with respect to instant claim 24 when an acid salt is not chosen, the limits set forth do not apply to the method of claim 24.

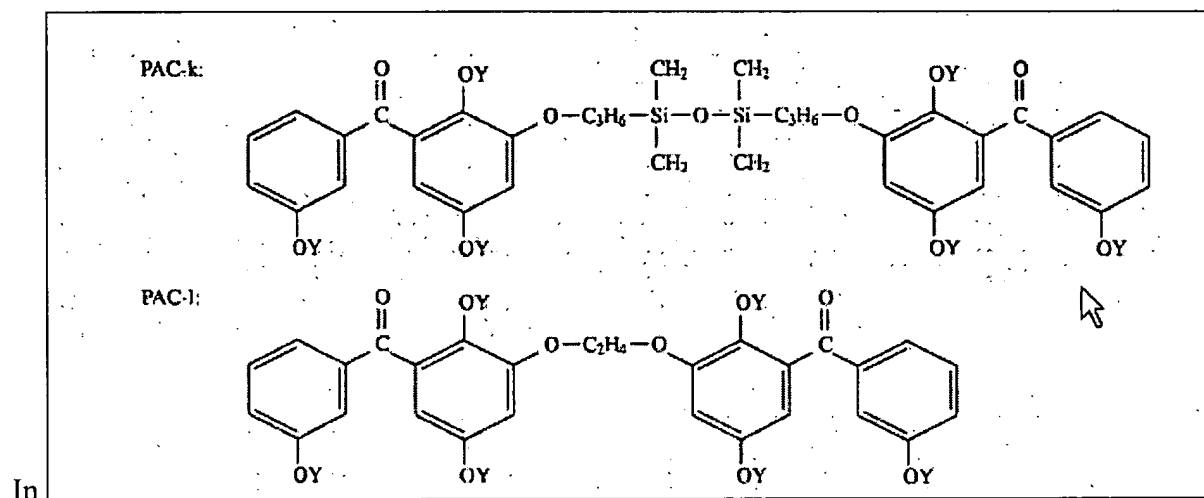
16. Claims 21- 22, 25-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Oba et al (5,518,864). The method used for imaging examples 49 and 51 in Oba et al anticipate the

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instant method of claims 21- 22, 25-27 wherein the crosslinker is a substituted di benzophenone.



The substitution is with



And the polyamic acid is held as an oligomer as required by instant claim 27. In col. 61 and 62, the final products are called negative fine patterns. In col. 21 of Oba et al the ketene formed by exposure is used during heating to form the crosslinking for the negative pattern. Thus, the method of imaging found in Oba et al anticipates the instant method wherein the A1 and A1 are instant (II) in claim 21.

17. Claims 21-23 and 25-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Sawada et al (4,433,043) as evidenced by Cao et al (Polymer International). With respect to instant claims 21-27, the method of Example 1 of Cao et al anticipates the instant method wherein photoactivation of one photon is the step and the crosslinker is sulfate of a condensate of p-diazo diphenyl amine and paraformaldehyde which as evidenced by Cao on page 143 and 146

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reads on the (V) instant crosslinker structure in claim 21 with R being an ionic group, and cattle bone collagen is the molecule being crosslinked. The examiner notes that in col. 3, lines 35-52, of Sawada et al describe the collagen as a peptide resin, i.e. a peptide oligomer and a peptide and a protein, and an oligomer as set forth in instant claim 27, and in col. 3 lines 5-22 the system is water based, i.e. water soluble, in Sawada et al and as required in instant claims 22-24. The salt is that of a sulfate.

18. Claims 21-23, and 25-26 rejected under 35 U.S.C. 102(b) as being anticipated by Cao et al (Polymer International). With respect to instant claims 21-23, and 25-26, the processes of Cao et al anticipate the instant process wherein photoactivation of one photon is the step and the crosslinker is misitylene sulfate of a condensate of p-diazo diphenyl amine and paraformaldehyde which as taught by Cao et al in Resin preparation on page 143 and 146 reads on the (V) instant crosslinker structure in claim 21. Binder resins A and C2 gave clear images as shown in Table 4.

19. Claims 21 and 25-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Tocker (3,265,772). With respect to instant claims 21 and 25-26, Examples 9-15 of Tocker anticipate the instant method wherein single photon excitation is used and the photoactive group is benzophenone.

20. Claims 21-22 and 25-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Curtis (4,602,097). The methods of Curtis anticipate the instant method wherein A1 and A2 comprise (II). See all of Curtis and especially Examples 16 –17.

21. Claims 21 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Everaerts et al (WO 93/16131). With respect to instant claims 21 and 26, the photocrosslinking processes of

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Everaerts et al anticipate the instant processes wherein A1 and A2 comprise (II). See the abstract and the examples therein.

22. Claims 21 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Stark et al (WO 97/07161). With respect to instant claims 21 and 26, the photocrosslinking processes of Stark et al anticipate the instant processes wherein A1 and A2 comprise (II). See the examples, Abstract and page 10.

23. Claims 21 and 26-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Li et al (2003/0194715 A1). With respect to instant claims 21 and 26-27, the linking to the polymer formed on the substrate in Li et al via two or more benzophenone groups anticipates the instant process.

24. Claims 21 and 26-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Swan et al (5,637,460). With respect to instant claims 21 and 26-27, the linking to the polymeric substrate of the tetrabenzophenone compound in Swan et al forms the instant crosslinker via one benzophenone link per tetrahedral compound. When exposed to any of the listed Target Molecules in Swan in col. 9-10, the processes when irradiated anticipate the instant process of claims 21 and 26-27 as do the examples of Swan. DNA, cellulose, and collagen are among the examples of materials crosslinked to the substrate via the polymeric crosslinker. See in Swan et al, particularly col. 8 and one step method in col. 7.

25. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tsunoda et al (4,424,325) show poly benzophenone compounds but there is no indication of crosslinking other difference compounds with these poly benzophenone compounds. Schwartz et al (2005,0271590 A1) is not prior art to this application but makes use

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of a species of the instant process as found in claim 8. Schwartz et al is drawn to treating tissue of the eye only.

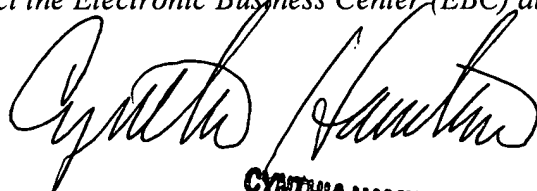
26. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Hamilton whose telephone number is 571-272-1331. The examiner can normally be reached on Monday through Friday 9:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on (571) 272-0729. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


**CYNTHIA HAMILTON
PRIMARY EXAMINER**

Cynthia Hamilton
Primary Examiner
Art Unit 1752

February 20, 2006